

## NETWORKING ARCHITECTURE

### COURSE DESCRIPTION

This course, which is a part of the arts and communication cluster, stresses the conceptual and practical skills necessary to design and manage networks. Course content, which is of the project-based format, allows the student to interconnect workstations, peripherals, terminals, and other networking devices creating an integrated system where all devices speak the same language or protocol. Course content is designed to prepare students for certification to design, build, and maintain computer networks. Upon completion of the networking sub-cluster, graduates will be prepared to take the Cisco Certified Networking Associates exam or Net plus examination. Over 190,000 high-technology jobs are currently available in U. S. corporations for graduates and employment opportunities are increasing.

**Prerequisites:** Information Technology Infrastructure Algebra I or Math for Technology II (may be concurrent)

**Recommended:** Networking Essentials

**Recommended Credit:** 1

**Recommended Grade Level:** 10<sup>th</sup>, 11<sup>th</sup>, or 12<sup>th</sup>

<b>NETWORKING ARCHITECTURE STANDARDS</b>
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- 1.0 Students will demonstrate an understanding of basic network structure.
- 2.0 Students will analyze major network operating systems, such as Microsoft Windows NT, Novell NetWare, and Unix.
- 3.0 Students will associate Internetwork Packet Exchange (IPX), Internet Protocol (IP), and NetBEUI with their appropriate functions.
- 4.0 Students will be able to define RAID technology and how each level relates to fault tolerance or high availability.
- 5.0 Students will analyze the open system interconnect (OSI) reference model.
- 6.0 Students will recognize and describe the characteristics of networking media and connectors.
- 7.0 Students will compare the basic attributes, purpose, and function of network elements.
- 8.0 Students will study router, technology switching, and management of networks.
- 9.0 Students will manage networks.
- 10.0 Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

# **NETWORKING ARCHITECTURE**

## **STANDARD 1.0**

Students will demonstrate an understanding of basic network structure.

## **LEARNING EXPECTATIONS**

The student will:

- 1.1 Evaluate the characteristics of star, bus, mesh, and ring topologies, their advantages and disadvantages.
- 1.2 Research the characteristics of segments and backbones.
- 1.3 Define flow control and describe basic methods used in networking.

## **PERFORMANCE STANDARD: EVIDENCE STANDARD IS MET**

The student:

- 1.1 Compares the advantages and disadvantages of star, bus, mesh, and ring topologies.
- 1.2 Demonstrates the characteristics of segments and backbones.
- 1.3 Charts information flow.

## **SAMPLE PERFORMANCE TASK**

- Diagram star, bus, mesh, and ring topologies.
- Choose one topology and make the proper connections.

## **INTEGRATION LINKAGES**

SkillsUSA-VICA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA), Secretary's Commission on Achieving Necessary Skills (SCANS), *Professional Development Program* - SkillsUSA-VICA, CompTIA, Cisco Networking Technologies, Computer Skills, Science, Electronics, Networking Skills, Math, Language Arts, Teambuilding Skills, Communication Skills, Critical-Thinking Skills, Internet Navigation Skills

# **NETWORKING ARCHITECTURE**

## **STANDARD 2.0**

Students will analyze major network operating systems, such as Microsoft Windows NT, Novell NetWare, and Unix.

## **LEARNING EXPECTATIONS**

The student will:

- 2.1 Research client bases that best serve specific network operating systems and their resources.
- 2.2 Analyze the directory services of the major network operating systems.

## **PERFORMANCE STANDARD: EVIDENCE STANDARD IS MET**

The student:

- 2.1.A Outlines characteristics of network operating systems and resources.
- 2.1.B Outlines characteristics of particular clients to determine networking operating systems.
- 2.2.A Logs onto the directory tree and makes changes.
- 2.2.B Adds and deletes users on the directory service.

## **SAMPLE PERFORMANCE TASK**

- Install and test client software for a given operating system.
- Create new users and sets up their rights.

## **INTEGRATION LINKAGES**

SkillsUSA-VICA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA), Secretary's Commission on Achieving Necessary Skills (SCANS), *Professional Development Program* - SkillsUSA-VICA, CompTIA, Cisco Networking Technologies, Computer Skills, Science, Electronics, Networking Skills, Math, Language Arts, Teambuilding Skills, Communication Skills, Critical-Thinking Skills, Internet Navigation Skills

# **NETWORKING ARCHITECTURE**

## **STANDARD 3.0**

Students will associate Internetwork Pocket Exchange (IPX), Internet Protocol (IP), and NetBEUI with their appropriate functions.

## **LEARNING EXPECTATIONS**

The student will:

- 3.1 Research the differences, advantages, and disadvantages of standard protocols.
- 3.2 Set up and properly configure standard protocols.
- 3.3 Configure IPX access lists and SA (selective availability) filters to control basic Novell and traffic.

## **PERFORMANCE STANDARD: EVIDENCE STANDARD IS MET**

The student:

- 3.1.A Evaluates the findings of research on standard protocols.
- 3.1.B Compares a network monitor and a network or protocol analysis.
- 3.2 Installs and configures standard protocols.
- 3.3.A Enables the Novell IPX protocol and configures interfaces.
- 3.3.B Monitors Novell IPX operation on the router.

## **SAMPLE PERFORMANCE TASK**

- Determine when each protocol is to be used.
- Network two computers using appropriate protocol and test.
- Establish IP default network command using dynamic routing protocols.

## **INTEGRATION LINKAGES**

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# **NETWORKING ARCHITECTURE**

## **STANDARD 4.0**

Students will be able to define RAID technology and how each level relates to fault tolerance or high availability.

## **LEARNING EXPECTATIONS**

The student will:

- 4.1 Evaluate various types of RAID technology.
- 4.2 Relate volumes as related to the hard drive.
- 4.3 Research the various types of tape backup, and how each is used.

## **PERFORMANCE STANDARD: EVIDENCE STANDARD IS MET**

The student:

- 4.1A Defines mirroring and the associated RAID level.
- 4.1.B Defines duplexing and the associated RAID level.
- 4.1.C Defines stripping and the associated RAID level.
- 4.2 Describes volumes and how they are used.
- 4.3 Explains various types of tape backup and give the purpose of each.

## **SAMPLE PERFORMANCE TASK**

- Develop a Power Point presentation showing the different types of RAID technology.
- Describe relationship between hard drive and volume as related to security.
- Implement a tape backup.

## **INTEGRATION LINKAGES**

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# **NETWORKING ARCHITECTURE**

## **STANDARD 5.0**

Students will analyze the open system interconnect (OSI) reference model.

## **LEARNING EXPECTATIONS**

The student will:

- 5.1 Evaluate the three categories of the open system interconnect (OSI) model.
- 5.2 Evaluate the protocols, services, and functions that pertain to each layer of the open system interconnect (OSI) reference model.

## **PERFORMANCE STANDARD: EVIDENCE STANDARD IS MET**

The student:

- 5.1.A Analyzes the network layer of the open system interconnect (OSI) reference model.
- 5.1.B Analyzes the data link layer of the open system interconnect (OSI) reference model.
- 5.1.C Analyzes the physical layer of the open system interconnect (OSI) reference model.
- 5.1.D Analyzes the functions of each layer of the International Standard Organization's open system interconnect (ISO/OSI) reference model.
- 5.2.A Appraises the values of bridges and switching devices.
- 5.2.B Installs LAN switching devices.
- 5.2.C Creates broadcast domains.
- 5.2.D Evaluates the strengths and weaknesses of various topologies relating to underlying cable.
- 5.2.E Locates and implements industry standards, such as the EIA/TIA 568 specifications.
- 5.2.F Builds a path between LAN segments that will filter the flow of data packets.
- 5.2.G Uses routers to impose logical structure.
- 5.2.H Relates protocols, services, and functions to the open system interconnect (OSI) model.

## **SAMPLE PERFORMANCE TASK**

- List the key internetworking functions of the open system interconnect (OSI) Network layer.
- Draw and label the open system interconnect (OSI) model.
- List reasons the information technology industry uses a layered model.
- Develop a presentation on collision domains and broadcast domains that explains how they affect the performance of the network.
- Perform a cable audit to identify areas that need upgrades and rewiring.
- Add router ports.

## **INTEGRATION LINKAGES**

SkillsUSA-VICA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA), Secretary's Commission on Achieving Necessary Skills (SCANS), *Professional Development Program* - SkillsUSA-VICA, CompTIA, Cisco Networking Technologies, Computer Skills, Science, Electronics, Networking Skills, Math, Language Arts, Teambuilding

Skills, Communication Skills, Critical-Thinking Skills, Internet Navigation Skills, Electronic Industries Alliance (EIA)/Telecommunications Industry Association (TIA) Standards

# **NETWORKING ARCHITECTURE**

## **STANDARD 6.0**

Students will recognize and describe the characteristics of networking media and connectors.

## **LEARNING EXPECTATIONS**

The student will:

- 6.1 Compare the advantages and disadvantages of coax, Cat 3, Cat 5, fiber optic, UTP, and STP and the conditions under which they are appropriate.
- 6.2 Recognize the visual appearance of RJ45 and BNC and how they are crimped.

## **PERFORMANCE STANDARD: EVIDENCE STANDARD IS MET**

The student:

- 6.1.A Defines the length and speed of 10Base2, 10BaseT, and 100BaseT.
- 6.1.B Defines the length and speed of 10Base5, and 100Base TX.
- 6.2 Constructs a Cat 5 cable.

## **SAMPLE PERFORMANCE TASK**

- Describe coax, Cat 3, Cat 5, fiber optic, Unshielded Twisted Pair (UTP), and Shielded Twisted Pair (STP) and when each is used.
- Build and test a Cat 5 cable.

## **INTEGRATION LINKAGES**

SkillsUSA-VICA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA), Secretary's Commission on Achieving Necessary Skills (SCANS), *Professional Development Program* - SkillsUSA-VICA, CompTIA, Cisco Networking Technologies, Computer Skills, Science, Electronics, Networking Skills, Math, Language Arts, Teambuilding Skills, Communication Skills, Critical-Thinking Skills, Internet Navigation Skills, Connectivity Skills

# **NETWORKING ARCHITECTURE**

## **STANDARD 7.0**

Students will compare the basic attributes, purpose, and function of network elements.

## **LEARNING EXPECTATIONS**

The student will:

- 7.1 Compare and contrast full and half-duplexing.
- 7.2 Differentiate a wide area network (WAN) and local area network (LAN).
- 7.3 Compare and contrast a server, workstation, host, and client.
- 7.4 Analyze server-based networking and peer-to-peer networking.
- 7.5 Research the terms cable, network interface card (NIC), and router.
- 7.6 Compare and contrast broadband and baseband.

## **PERFORMANCE STANDARD: EVIDENCE STANDARD IS MET**

The student:

- 7.1 Describes full and half-duplexing in Ethernet operation.
- 7.2.A Develops a presentation explaining wide area network (WAN) and local area network (LAN).
- 7.2.B Distinguishes between cut-through and store-and-forward LAN switching.
- 7.2.C Describes the benefits of virtual LANs.
- 7.2 Describes the differences between Server/Host and Workstation/Client.
- 7.3 Associates server-based and peer-to-peer networking.
- 7.4 Describes the following terms: cable, network, interface card (NIC), and router.
- 7.5 Illustrates broadband and baseband.

## **SAMPLE PERFORMANCE TASK**

- Set up a network card with full and half-duplex.
- Construct and test a peer-to-peer network.
- Create a user and login to the network.
- Discuss the differences in broadband and baseband.

## **INTEGRATION LINKAGES**

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# **NETWORKING ARCHITECTURE**

## **STANDARD 8.0**

Students will study router, technology switching, and management of networks.

## **LEARNING ESPECTATIONS**

The student will:

- 8.1 Demonstrate basic to advanced router and switching configurations.
- 8.2 Research management of basic to advanced networks.

## **PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET**

The student:

- 8.1.A Completes basic router configurations.
- 8.1.B Completes progressively more advanced router configurations.
- 8.1.C Sets up a firewall architecture.
- 8.1.D Completes basic router and switching configurations.
- 8.1.E Completes progressively more advanced router and switching configurations.
- 8.1.F Explains the function of switcher in a network.
- 8.2.A Relates connectivity, performance, and management control to routers.
- 8.2.B Analyzes ways to transport data across an internetwork.

## **SAMPLE PERFORMANCE TASKS**

- Configure a router with security measures such as host name and password.
- Configure sub interfaces on a physical interface.
- Configure parameters that control access to the router.
- Configures ACLs on border routers.
- Prepares presentation on the differences between static and dynamic routing.
- Determine the size of a collision domain.

## **INTEGRATION LINKAGES**

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# **NETWORKING ARCHITECTURE**

## **STANDARD 9.0**

Students will manage networks.

## **LEARNING EXPECTATION**

The student will:

- 9.1 Research network management involving network documentation, network security, environmental factors, network performance, server administration, and network troubleshooting.
- 9.2 Analyze networking systems, determine problems, and make corrections.
- 9.3 Manages an advanced networking system.

## **PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET**

The student:

- 9.1.A Analyzes the network administrator's memory.
- 9.1.B Maintains a secure network.
- 9.1.C Sets standards to control environmental factors.
- 9.1.D Maintains network performance.
- 9.1.E Manages peer-to-peer and client/server networks.
- 9.2.A Sets up operating procedure manual for a network.
- 9.2.B Completes an engineer's journal for documenting the network management.
- 9.2.C Completes a systematic analysis of the network.

## **SAMPLE PERFORMANCE TASKS**

- Maintain diagrams of the physical wiring layout, cable information, and wiring schematic.
- Develop a plan for protecting equipment involving electrical irregularities, electromagnetic interference (EMI), and viruses.
- Record several types of network performance data.
- Perform network troubleshooting.

## **INTEGRATION LINKAGES**

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## **NETWORKING ARCHITECTURE**

### **STANDARD 10.0**

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

### **LEARNING EXPECTATIONS**

The student will:

- 1.1 Demonstrate positive leadership skills in the classroom and community.
- 1.2 Participate in SkillsUSA-VICA as an integral part of classroom instruction.
- 1.3 Investigate how technology has made an impact on networking architecture in the past 2 years.
- 1.4 Construct a job search network.

### **PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET**

The student:

- 1.1 Serves as a volunteer in the community.
- 1.2.A Applies the points of the creed to personal and professional situations.
- 1.2.B Completes a job search for employment opportunities.
- 1.3.A Writes a technical report that shows technological advancements in networking architecture.
- 1.4.A Refines employment portfolio.
- 1.4.B Assists with an officer campaign with Tennessee SkillsUSA-VICA.

### **SAMPLE PERFORMANCE TASKS**

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various SkillsUSA-VICA programs and/or competitive events.
- Analyze entry-level job skills and demonstrate proficiency in each skill.
- Implement an annual program of work.
- Attend a professional organization meeting.
- Participate in the Community Service competition with SkillsUSA-VICA.

### **INTEGRATION LINKAGES**

SkillsUSA-VICA, *Professional Development Program*, SkillsUSA-VICA, Communications and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Math, Math for Technology, Applied Communications, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies